May 2, 1967 J. H. BEARD 3,316,749

PRESSES

Filed Aug. 6, 1964 3 Sheets-Sheet 1

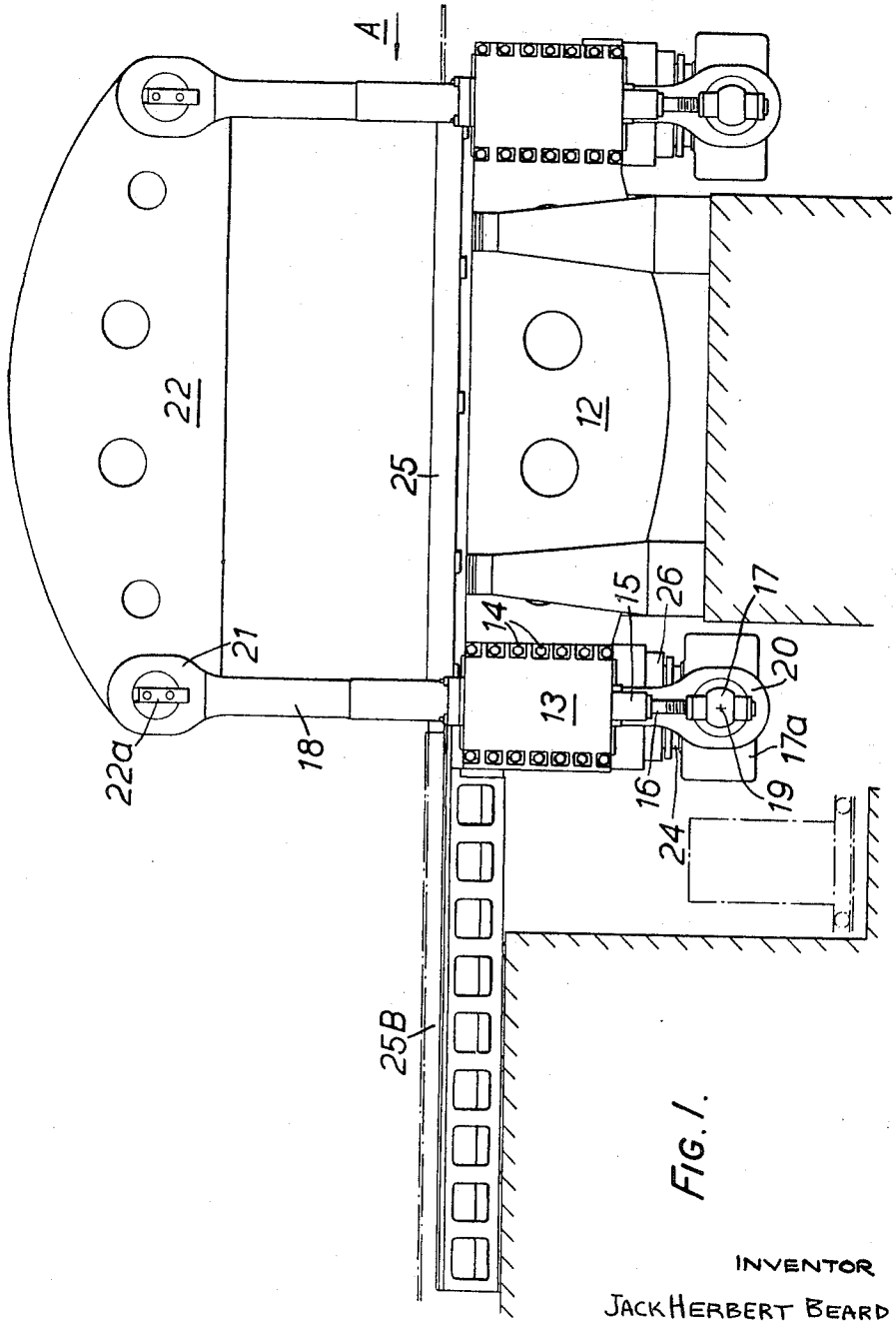

FIG. 1.

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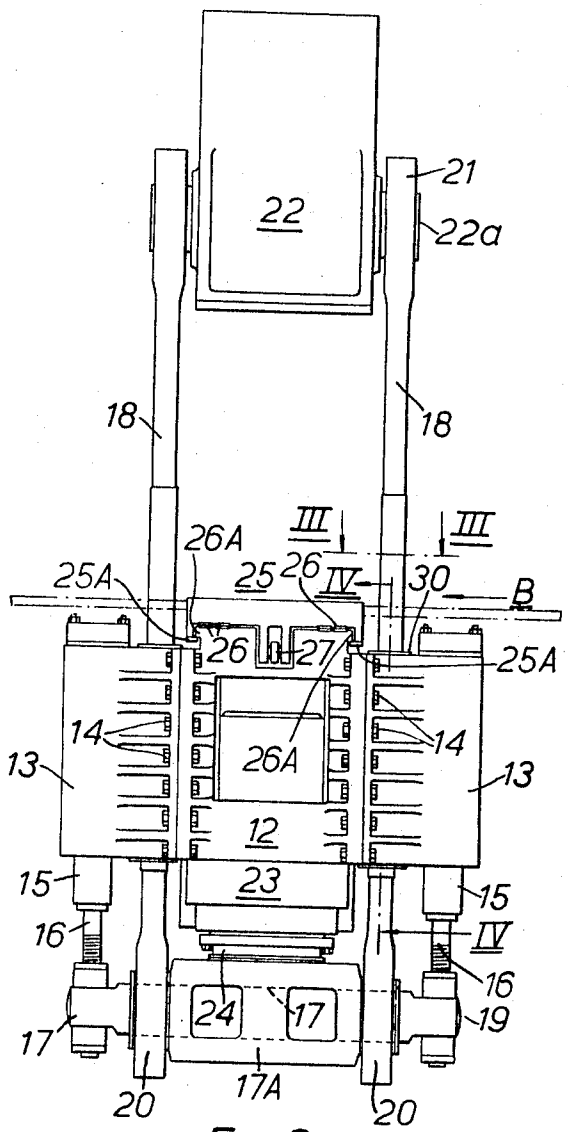

FIG. 2.

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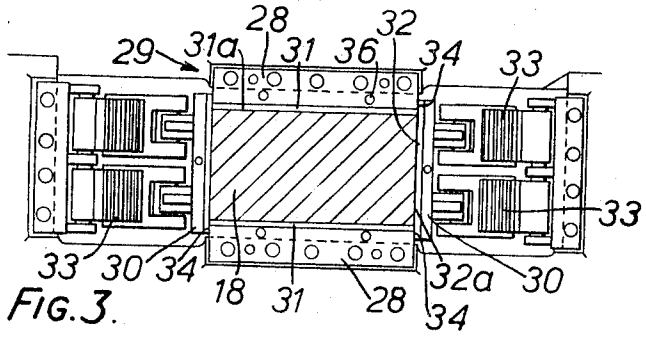

FIG. 3.

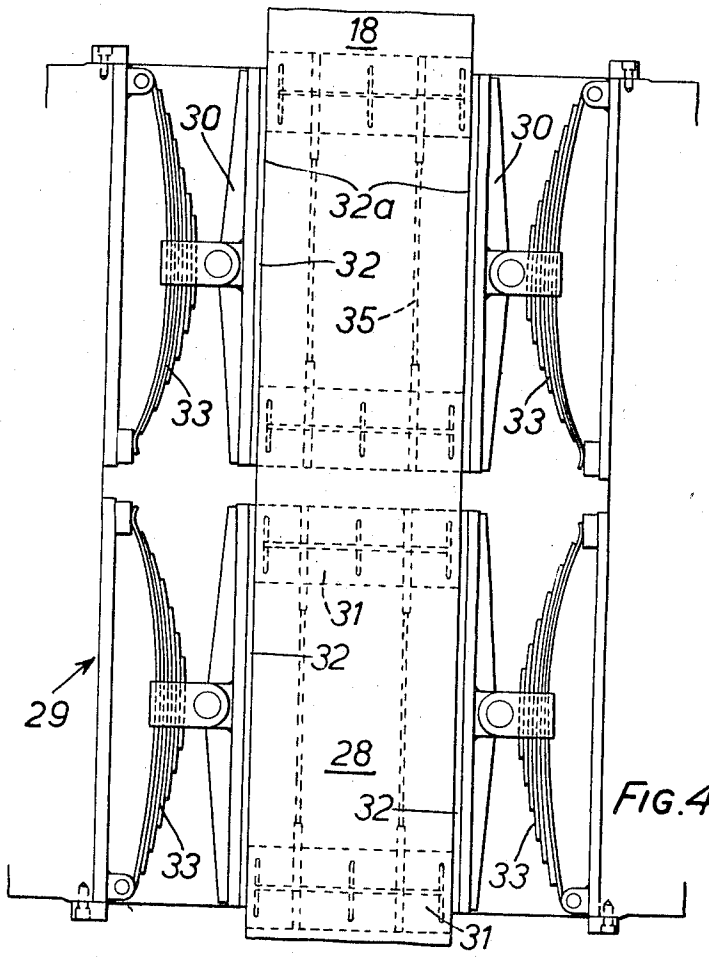

FIG. 4.

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3,316,749

PRESSES

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Claims priority, application Great Britain, Aug. 13, 1963, 31,845/63
9 Claims. (Cl. 72—450)

This invention relates to presses.

In presses having extensive surfaces between which the work is to be compressed, the length of the movable beam of the press is limited by the permissible bending moments which may be induced in tie-bars connecting the movable beam to the press operating rams. In conventional presses these tie-bars are rigid and are rigidly attached to the movable beam. If one side of the movable beam moves faster than the other side so that it tilts, a bending moment is exerted on the tie-bars. The greater the distance between the tie-bars the greater the bending moment experienced, so that with a long beam the tie-bars or associated structure would be damaged in the event of a sufficient difference in movement at one end of the beam as compared with the other end. Such a difference in movement could be caused, for example, by control or pump failure in the hydraulic or electric equipment or by the work being asymmetrically arranged about the press centre line.

In one aspect the present invention provides a press having a movable beam connected to drive means through a plurality of tie-bars, each tie bar being pivotally connected at one end to the beam and at the other end to the drive means and arranged to slide in pre-loaded spring guides.

In another aspect the invention provides a press having a vertically reciprocable elongate beam, four tie-bars connecting the beam to drive means, each tie bar having one end pivotally connected to a respective corner of the beam for rotation relative to the beam about a horizontal axis normal to the length of the beam and having its other end pivotally connected to the drive means for rotation relative thereto about a horizontal axis normal to the length of the beam, and guide means associated with each tie-bar, each guide means including pre-loading spring means arranged to urge the guide means to support the tie-bars in a vertical position.

An embodiment of press, in accordance with the invention, will now be described, by way of example only, with reference to the accompanying drawings of which:

FIGURE 1 is a front view of a draw-down bending press, from the direction in which the material to be pressed enters the press,

FIGURE 2 is a side view of the press in the direction of arrow A in FIGURE 1,

FIGURE 3 is a section on an enlarged scale on the line 3—3 in FIGURE 2, and

FIGURE 4 is a section on an enlarged scale on the line 4—4 in FIGURE 2.

Referring to FIGURES 1 and 2, the press is mounted on a base **12** at the corners of which four side extensions **13** are secured by bolts **14**. A pair of driving crossheads **17***a* extend across the short sides of the press. Four hydraulic lifting cylinders **15** mounted in the extensions **13** have rams **16** connected in pairs across the short sides of the press by shafts **17** rigidly secured to the beams **17***a*. Four vertical tie-bars **18** are arranged at the corners of the press and each has its lower end **20** pivotally connected to one of the shafts **17** so that it can pivot relative to the crosshead **17***a* about the horizontal axis **19** of its associated shaft **17**, and its upper end **21** pivotally connected to the upper horizontal elongate beam **22** of the press so that it can pivot relative to the beam about a horizontal axis **22***a* normal to the length of the beam and parallel to the axis **19**. Two hydraulic power cylinders **23** mounted in the base **12** have rams **24** which act on the beams **17***a* respectively to drive the beam **22** downwards for the working trip of the press.

A movable table **25** is supported in the centre of the press on slides **26** on the top of base **12**, and the table is provided with extensions **25***a* which engage under shoulders **26***a* on the table supporting part of base **12**. The table is movable out of the press, to the left in FIGURE 1, by means of a hydraulic cylinder and ram, not shown, coupleable to the table at **27**.

Material to be bent enters the press in the direction of arrow B in FIGURE 2 and after being pressed leaves the press on table **25** which is slid onto a support **25***b* which forms an extension of the table supporting part of the press **12**. The bent material can be lifted off the table by means of a crane or the like.

Referring to FIGURES 3 and 4 each tie-bar **18** has a substantially rectangular horizontal cross-section and is guided for vertical movement in a guide means **29**. Each guide comprises a pair of opposed fixed guide plates **28** carrying phosphor bronze bearing plates **31** having vertical bearing surfaces **31***a* arranged in planes parallel to the length of beam **22** and a pair of opposed spring loaded guides **30** carrying phosphor bronze bearing plates **32** having vertical bearing surfaces **32***a* arranged in planes normal to the length of the beam **22**. Each guide **30** is acted on by two leaf springs **33**, which springs are pre-loaded, for example, with a force of 1.42 tons per spring, so that the guides bear against the edges **34** of the fixed guides **28**. The guides are arranged in two banks, one above the other, as seen in FIGURE 4, so that there are eight springs acting on each tie-bar **18**. Lubrication channels **35** in the bearing surfaces of the phosphor bronze plates may be supplied from lubrication connecting points **36**. It will be appreciated that the leaf springs **33** may be replaced by coil springs or any other suitably resilient abutment.

This invention provides that the tie-bars connecting the beam **22** and the drive rams **24** and **16** are sufficiently rigid to support the press in an open position and yet are flexible enough to permit deviation from an upright position consequent upon dis-similarity of movement of one end of the other beam as compared with the other end. This means that the width of the press can be considerably increased over the width of conventional presses having rigidly connected tie-bars, without danger of damaging the tie-bars. For example, in the embodiment illustrated the tie-bars **18** are spaced in the direction of the length of the beam by a distance of 29 feet 5½ inches; consequently the press can press large pieces of material in a single action.

What I claim is:

1. A press comprising a vertically reciprocable elongate beam, drive means for reciprocating the beam, four tie bars each having a substantially rectangular horizontal cross section connecting the beam to the drive means, each tie bar having one end pivotally connected to a respective corner of the beam for rotation relative to the beam about a horizontal axis normal to the length of the beam, and having its other end pivotally connected to the drive means for rotation relative thereto about a horizontal axis normal to the length of the beam, and guide means associated with each tie bar for urging the tie bars to a vertical position, each guide means including a pair of fixed guide plates having guide surfaces parallel to the length of the beam and a pair of movable guide plates having guide surfaces normal to the length of the beam,

and preloaded spring means arranged to bias the movable plates towards the associated tie bar.

2. A draw-down press comprising a vertically reciprocable elongate beam, four upright tie bars each having a substantially rectangular horizontal cross section, each tie bar having its upper end pivotally connected to a respective corner of the beam for rotation relative to the beam about a horizontal axis normal to the length of the beam, a pair of crossheads below the ends of the beam, the lower ends of each of the tie bars being pivotally connected to the crossheads and mounted to permit rotation relative thereto about a horizontal axis normal to the length of the beam, a pair of vertically reciprocable ram and cylinder assemblies one arranged to act on each crosshead to drive the crossheads, tie bars and beam downwards for the working stroke of the press, and guide means associated with each tie bar for urging the tie bars to a vertical disposition, each guide means including guide members bearing against each surface of the tie bars; and those guide members acting on the surfaces of the tie bars normal to the length of the beam including preloaded spring means arranged to bias the guide members towards their associated tie bars.

3. A press according to claim 1 in which the spring means are leaf springs.

4. A press according to claim 1 in which the spring means are pre-loaded to bias the movable guide plates against the edges of the fixed guide plates.

5. A press according to claim 1 in which the bearing surfaces of the guide means are phosphor bronze.

6. A press according to claim 1 including means for lubricating the bearing surfaces of the guide means.

7. A press according to claim 1 which is a draw-down press in which the drive means includes a pair of crossheads connected across the narrow sides of the press and to which the lower ends of the tie-bars are pivotally connected and including a pair of ram and cylinder assemblies one arranged to act on each crosshead to drive the crosshead and beam downwards for the working stroke of the press.

8. A press according to claim 7 including four lifting cylinder and ram assemblies coupled to the crossheads and arranged to drive the crossheads and beam upwards.

9. A press according to claim 1 including a workpiece supporting table arranged to receive material to be pressed from one direction and including means for sliding the table out of the press in a direction normal from that in which material enters the press to a position in which it clears the beam.

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